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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/620,675
Filing Date: July 15, 2003
Appellant(s): PUNSALAN ET AL.

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GROUP 1700

Stephen L. Nichols
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed September 4, 2007 appealing from the Office action mailed December, 21, 2007.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

Appellant traverses the election restriction of claims 66 and 67 as being improper, but withdraws them for appeals purpose.

Examiner respectfully disagrees with the traversal. As stated in the previous office action "a method of manufacturing an electrolyte comprising depositing charge polymeric electrolyte particles on a substrate by electrophoretic deposition and subsequently depositing additional charge polymeric electrolyte particles on the substrate by electrolytic deposition" is a distinct species from "a method of manufacturing an electrolyte comprising coupling a substrate to a charge electrode and electrodepositing a polymeric electrolyte on the substrate" as recited in the original claims. They are distinct species, because electrodepositing and electrophoretic deposition are not the same in scope, as electrophoretic deposition is only one type of electrodeposition.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct. The changes are as follows: Claims 1, 2, 4-18, 55-59, and 61-65 are rejected under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of U.S. 2002/0172871 (Schucker et al.) and US 2001/0033314420 (Takeuchi et al.) *as evidenced by* US 5002647 (Tanabe et al.), whereas claims 56 and 59 are rejected under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of U.S. 2002/0172871 (Schucker et al.), US 2001/0014420 (Takeuchi et al.), and US 5002647 (Tanabe et al.)

*Appellant notes that the rejection for claims 56 and 59 were listed separately from the rejections of claims 1 and 57, wherein the basis for the rejection is the same. However, this is not the case. The latter applies Tanabe et al. in a 103 construct, while the former merely relies on Tanabe et al. as an evidentiary piece.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

2002/20172871	SCHUCKER	11-2002
2001/0014420	TAKEUCHI	8-2001

5,002,647	TANABE	3-1991
5,441,823	NAIMER	8-1995
6,258,861	STECK	7-2001
6,589,682	FLECKNER	7-2003
2006/0188774	NIU	8-2006

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

4. Claims 1,2,4-18,55,57,58,61-65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schucker (US 2002/0172871 A1) in view of Takeuchi et al. (US 2001/0014420 A1) as evidenced by Tanabe et al. (US 5,002,647).

With respect to claims 1,4,6,7,11-13,17,18,55,57,58,62,63, Schucker teaches a method of manufacturing a composite electrolyte comprising coupling a porous substrate to an electrode and applying, via electrophoretic deposition, an ionic conductive composition on said substrate. The composition encompasses NASICON ($Na_3Zr_2Si_2PO_{12}$). See Paragraphs 31-33. However, Schucker do not specifically teach the ionic conductive composition is a polymeric electrolyte, such as a perfluorosulfonate ionomers. Takeuchi et al. teach an ionic conducive material for use as a membrane in a fuel cell can be an inorganic compound such as NASICON or a polymeric compound, such as Nafion (a perfluorosulfonate ionomers material). See abstract, Paragraph 118. Therefore, it would have been obvious to one of ordinary skill in the art to substitute a

perfluorosulfonate ionomers for a NASICON as the electrolyte on the porous substrate of Schucker, because Nafion and NASICON are considered functionally equivalent ionic conductive material. It is also recognized in the art that the electrophoretic deposition is an electrodeposition process as evidenced by Tanabe. See Abstract, Column 1, Lines 6-55.

With respect to claim 2, the porous substrate, such as yttria-stabilized zirconia, is an ionic conductive material.

With respect to claim 5,10,16,61, it is well known in the art that the electrophoretic deposition involves a starting material for the solid electrolyte in a solvent system, applying an electric field between an anode and a cathode provided in the solvent system, and thus causing the material to be deposited on the surface of a substrate connected to the cathode terminal (charged electrode). See Tanabe et al., Column 1, Lines 6-55.

With respect to claims 8,9,64,65, the disclosure of Schucker and Takeuchi differs from Appellant's claims in that Schucker and Takeuchi et al. do not teach the removal of the deposited perfluorosulfonate ionomers by machining with a blade. Nevertheless, Schucker teach the uniform thickness of the electrolyte is preferred. See Paragraph 52. Therefore, it would have been obvious to one of ordinary skill in the art to remove the excess perfluorosulfonate ionomer particles on the surface of the porous substrate by using a knife (blade), because Schucker teaches the uniform thickness of the electrolyte is preferred.

With respect to claims14,15, Schucker teaches the use of titanium oxide, which is non-electrical conductive.

5. Claims 2-7,60-64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schucker (US 2002/0172871 A1) in view of Takeuchi et al. (US 2001/0014420 A1) as applied to claims 1,2,4-18,55,57,58,61-65 above, and further in view of Tanabe et al. (US 5,002,647) and Steck et al. (US 6,258,861 B1).

With respect to claims 2,3,60-64, Schucker and Takeuchi disclose a method of manufacturing an electrolyte as described above in Paragraph 4. However, Schucker and Takeuchi do not disclose the use of an electrically conductive porous substrate. Tanabe et al. teach a method of preparing a solid electrolyte by means of electrophoresis (an electrodeposition process). The process involves a powder of a starting material for the solid electrolyte in a solvent system, applying an electric field between an anode and a cathode provided in the solvent system, and thus causing the powder to be deposited on the surface of a substrate connected to the cathode terminal (charged electrode). Tanabe et al. teach the cathode can be selected form the group consisting of stainless steel, platinum plate, ZrO_2 and La-Sr-Co oxide. See Column 1, Lines 6-55, Column 4, Lines 16-29. Therefore, it would have been obvious to one of ordinary skill in the art to substitute a stainless steel for the yttria-stabilized zirconia as the substrate in the method disclosed by Schucker and Takeuchi, because Tanabe et al. teach zirconia and stainless steel are considered functionally equivalent substrates to be connected to the cathode in an electrophoresis process.

Moreover, Schucker, Takeuchi and Tanabe do not teach or suggest the use of a porous stainless steel substrate. Steck et al. teach the use of a porous substrate material in the fabrication of a composite membrane in which polymer can be impregnated into the porous substrate and provides better mechanical strength as a result of intimate contact between the two components. See Column 2, Lines 20-47. Therefore, it would have been obvious to one of ordinary skill in the art to incorporate a porous stainless steel substrate onto the method of manufacturing an electrolyte of Schucker, Takeuchi and Tanabe, because Steck et al. teach the use of a porous substrate to enhance the mechanical strength of the resulting electrolyte membrane.

With respect to claim 4, Schucker teaches the substrate is electrically coupled to the charge electrode. See Paragraphs 31-33.

With respect to claims 5,61, it is well known in the art that the electrophoretic deposition involves a starting material for the solid electrolyte in a solvent system, applying an electric field between an anode and a cathode provided in the solvent system, and thus causing the material to be deposited on the surface of a substrate connected to the cathode terminal (charged electrode). See Tanabe et al., Column 1, Lines 6-55.

With respect to claims 6,7,62-64, Takeuchi et al. teach an ionic conducive material for use as a membrane in a fuel cell can be a polymeric compound, such as Nafion (a perfluorosulfonate ionomers material). See abstract, Paragraph 118.

6. Claims 56,59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schucker (US 2002/0172871 A1) and Takeuchi et al. (US 2001/0014420 A1) as applied

to claims 1,2,4-18,55,57,58,61-65 above, and further in view of Tanabe et al. (US 5,002,647).

Schucker and Takeuchi disclose a method of manufacturing an electrolyte as described above in Paragraph 4. However, Schucker and Takeuchi only disclose the use of such polymeric electrolyte in electrochemical cells. Tanabe et al. teach the preparation of membrane by an electrophoresis process. The resulting electrolyte membrane can be used in a fuel cell, which comprises an anode, a cathode and a solid electrolyte. See Column 1, Lines 6-13. Therefore, it would have been obvious to one of ordinary skill in the art to use the polymeric electrolyte of Schucker and Takeuchi onto a fuel cell system, because Tanabe et al. teach the resulting solid electrolyte can be used in high temperature type fuel cells.

(10) Response to Argument

Issue I(a) – Appellant argues with respect to claim 1 and 57 that Schucker, Takeuchi et al., and Tanabe et al. fail to teach or suggest "coupling a substrate to a charged electrode" or "electrodepositing a polymeric electrolyte on that substrate."

Examiner respectfully disagrees and maintains that the combination of Schucker, Takeuchi et al., and Tanabe et al. reasonably teach of coupling a substrate to a charged electrode and electrodepositing a polymeric electrolyte on that substrate.

Schucker teaches a method for making thin-film electrolyte structures and compositions, which involves depositing a composition of the porous substrate onto an electrically conductive, oxidizable substrate (para 0031-0032). Then after the porous

substrate is deposited, an ionically conductive layer is applied via electrophoretic deposition (para 0033). Electrophoretic deposition onto the substrate layer inherently includes coupling the substrate in some manner to a charged electrode, as the process of electrophoresis requires the use of an electric field, and thus charged electrodes to create such an electric field. In this manner, the substrate must be coupled in some manner to a charged electrode, as is required for the process of electrophoresis.

Although Schucker does not teach that the electrolyte is polymeric, Schucker teaches the deposition of a NASICON ($Na_3Zr_2Si_2PO_{12}$) electrolyte. However Takeuchi et al. show that NASICON and Nafion (a perfluorosulfonate ionomer material) are ionically conductive functional equivalents (abstract, para 0118). Therefore, the combination of Schucker and Takeuchi et al. would teach electrodepositing polymeric electrolytic materials onto a substrate, as Schucker teaches the electrodepositing process with Takeuchi et al. equating the electrolytic material used by Schucker (NASICON) with a polymeric electrolytic material (Nafion). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Nafion as the electrolytic material in the deposition process of Schucker, since NASICON and Nafion are recognized equivalent electrolyte materials and replacement of NASICON with other materials, including Nafion, would have provided the predicable result of yielding an ionically conductive electrolyte. It has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin,* 125 USPQ 416. Furthermore, it is noted that Appellant does not argue the combination of Schucker and

Takeuchi et al., rather that Takeuchi et al. does not teach electrodepositing a polymer onto the substrate. However, Appellant does not argue how the combination of the material equivalents shown by Takeuchi et al. combined with the process of Schucker does not obviate the claimed subject matter. In response to Appellant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Appellant notes confusion at why Tanabe et al. was referred to within the rejection. Tanabe et al. is merely used as an evidentiary piece to affirm the fact that electrophoretic deposition (as taught by Schucker) is in fact an electrodeposition process, as is clearly stated within the body of the rejection.

Issue I(b) – Appellant argues with respect to claim 2 that the recitation of "wherein said substrate comprises a conductive porous substrate" means that the substrate is electrically conductive (whereas Schucker's conductive is ionically conductive).

Examiner respectfully disagrees. Although Appellant may wish the conductivity to apply to electric conductivity, such a property is not claimed. Thus, Appellant's term of "conductive" is not limited to being electrically conductive. Limitations appearing in the specification but not recited in the claim are not read into the claim. See *In re Zletz*, 893F.2d 319, 321-22, 13 USPQ2d, 1320, 1322 (Fed. Cir. 1989). Although the claims are interpreted in light of the specification, limitations from the specification are not read

into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Issue I(c) – Appellant argues with respect to claim 4 that Schucker fails to teach that a substrate is coupled to a charged electrode.

Examiner respectfully disagrees and upholds the rejection of record.

Schucker teaches a method for making thin-film electrolyte structures and compositions, which involves depositing a composition of the porous substrate onto an electrically conductive, oxidizable substrate (para 0031-0032). Then after the porous substrate is deposited, an ionically conductive layer is applied via *electrophoretic deposition* (para 0033). Electrophoretic deposition onto the substrate layer inherently includes coupling the substrate in some manner to a charged electrode, as the process of electrophoresis requires the use of an electric field, and thus charged electrodes to create such an electric field (as evidenced by Tanabe et al., which teaches of the generic electrophoresis process that is inherent to Schucker et al (col. 1, lines 15-25)). In this manner, the substrate must be coupled in some manner to a charged electrode, as is required for the process of electrophoresis.

Examiner would like to note some confusion as to why Appellant did not present this argument before the final rejection, as the rejection to claim 4 was maintained from the non-final rejection.

Issue I(d) – Appellant argues with respect to claims 5, 10, and 16 that there is not teaching of having a solution containing charged polymeric electrolyte particles,

disposing a porous substrate and charged electrode in such a solution, and generating an electric field in a polymeric electrolyte solution.

Examiner respectfully disagrees.

Tanabe et al. was relied on as an evidentiary piece show that electrophoresis is an electrodeposition process and to show the general electrophoresis process, which would be inherent to any electrophoresis process (i.e. the one disclosed by Schucker). Tanabe et al. asserts that electrophoresis involves having a solvent system (electrolyte solution) and applying an electric field to a substrate connected to a cathode terminal (charged electrode) (abstract; col. 1, lines 6-24 and 45-55). This process causes *charged particles* in the solvent system (electrolyte solution) to be deposited on the surface of the substrate by electrically attracting the particles (and thus indicates that the substrate and charged electrode are in the charged polymer electrolyte solution) (col. 1, lines 15-25).

Therefore, applying the process of electrophoresis, which is disclosed by Schucker, using Tanabe et al. as an evidentiary piece to outline the steps of electrophoresis inherently included in Schucker's teaching, shows that Schucker would include having an electrolyte solution, a charged electrode, and charged particles (as found in evidentiary piece Tanabe et al., set forth in the previous paragraph). Furthermore, Schucker teaches a method for making thin-film electrolyte structures and compositions, which involves depositing a composition of the porous substrate onto an electrically conductive, oxidizable substrate (para 0031-0032). Then after the porous substrate is deposited, an ionically conductive layer is applied via electrophoretic

deposition (para 0033). Electrophoretic deposition onto the substrate layer inherently includes coupling the substrate to a charged electrode, as the process of electrophoresis requires the use of an electric field, and thus charged electrodes to create such an electric field. In this manner, the substrate must be coupled to a charged electrode, as is required for the process of electrophoresis.

Finally, it is noted that Schucker (as evidenced by Tanabe et al.) in view of Takeuchi et al. obviates having a *polymeric* electrolyte solution. Schucker teaches depositing a NASICON ($Na_3Zr_2Si_2PO_{12}$) electrolyte (para 0031-0031). Takeuchi shows that Nafion and NASICON are functional equivalent electrolyte materials, where Nafion is a polymer (para 0118, lines 8-15). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use Nafion as the electrolytic material in the deposition process of Schucker since NASICON and Nafion are recognized equivalent electrolyte materials and replacement of NASICON with other materials, including Nafion, would have provided the predicable result of yielding an ionically conductive electrolyte. It has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin,* 125 USPQ 416. Therefore the combined teaching of Takeuchi et al. with Schucker would obviate using Nafion as the electrolyte solution, thus yielding a polymeric electrolyte solution.

Issue I(e) – Appellant argues with respect to claim 8 that there is no suggestion of the teaching that removes deposited perfluorosulfonate ionomer particles from an outer surface of said porous substrate.

Examiner would first like to note that the use of a perfluorosulfonate ionomer electrolyte has previously been obviated using Takeuchi et al. (which teaches the use of a Nafion electrolyte) (see response to Issue I(a) and 1(d)). And Niu et al. (para 0065), Fleckner et al. (example 1), and Naimer et al. (col. 2, lines 13-22) all confirm that Nafion is a perfluorosulfonate ionomer.

Examiner respectfully disagrees with Appellant's position and suggests removing deposited perfluorosulfonate ionomers from the substrate.

First, Examiner has met the necessary requirements to establish prima facie obviousness. The rationale was within the last office action and is reiterated herein. Schucker teach that uniform thickness of the electrolyte is preferred (para 0052). Thus, the motivation for wanting to remove deposited electrolyte particles from the outer substrate from an outer surface of a porous substrate is to make a resulting electrolyte with a uniform thickness. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made have been obvious to one of ordinary skill in the art to remove the excess perfluorosulfonate ionomer particles on the surface of the porous substrate, because Schucker teaches the uniform thickness of the electrolyte is preferred.

Although Appellant alleges that a request to Examiner was made to cite prior art demonstrating that the claimed removal of deposited perfluorosulfonate ionomer particles was known in the prior art prior to the final office actions, this is not the case. Therefore, the argument is irrelevant.

Furthermore, Appellant does not provide reasons or proof as to why it would not be obvious to remove the excess perfluorosulfonate ionomer particles on the surface of the porous substrate as applied to the obviousness statement set forth by the Examiner. Therefore, the rationale set forth above should still be maintained.

Issue II(a) – With respect to claim 2, Appellant argues the same issues as previous addressed in section I.

Examiner upholds the position and would like to point Appellant to refer to the response given in section I(b).

Issue II(b) – Appellant argues, with respect to claim 3, that the combination of Schucker, Takeuchi et al., Tanabe et al., and Steck et al. do not teach a conductive porous substrate, wherein the substrate is stainless steel. Notably, Appellant notes that Schucker teaches depositing a precursor to a porous substrate, which is later dried and sintered, and thus is incompatible with the claimed stainless steel substrate of claim 3, since Tanabe et al.'s teaching is drawn to a cathode and not a substrate.

Examiner respectfully disagrees.

First of all, Appellant makes the statement that Schucker's teachings do not include and are incompatible with the claimed stainless steel substrate of claim 3 without any proof of the incompatibility.

The position taken by Examiner, reiterated herein is that the materials of Schucker (yttria stabilized zirconia) and stainless steel (as taught by Tanabe et al.) are functional equivalents under conditions of electrophoresis, as is elaborated in the

following paragraphs. Thus Appellant's argument that Tanabe et al.'s teaching of stainless steel being the cathode is not applicable in the same capacity.

Schucker teaches the electrophoretic deposition of electrolyte onto a substrate (para 0031-0034). Schucker embodies that yttria-stabilized zirconia as the preferred porous substrate (para 0031).

Tanabe et al. teach an electrophoretic deposition process. Most notably, it teaches that under electrophoresis conditions that stainless steel and zirconia (ZrO_2) are functional equivalents (example 1, notably the cathode materials of col. 4, line 23).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to recognize that stainless steel (as taught by Tanabe et al.) could be used instead of zirconia (wherein zirconia is embodied by both Schucker and Tanabe et al.), since stainless steel and zirconia are recognized equivalent materials in the art and the replacement of zirconia with stainless steel would have yielded the predictable result of being able to function as a substrate for electrophoretic deposition. It has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin,* 125 USPQ 416.

Furthermore, Examiner recognized that replacing the porous zirconia as taught by Schucker with the stainless steel of Tanabe et al. would not necessarily yield a porous stainless steel. Steck et al. is relied upon to obviate that the substrate should be porous for the intended use of a substrate mechanical strength and for impregnation

purposes (wherein electrophoretic is an impregnation process, as particles are deposited on the substrate, thus impregnating it) (col. 2, lines 20-47).

Therefore, as set forth above, choosing between porous zirconia and porous stainless steel is merely a preference for the impregnation procedure of electrophoresis, is merely a materialistic choice (as set forth above), since both have been recognized equivalents under electrophoretic conditions, they would both reasonably be expected to act in the same manner.

In such a manner, Examiner upholds that all of the limitations of claim 3 have been addressed.

Issue II(c) – Appellant argues with respect to claim 60 a similar position as to the argument of claim 3. Specifically Appellant argues that it is not taught that the substrate is electrically-conductive and porous. Furthermore, Appellant argues that electrode (cathode) material has been confused with substrate material.

Examiner respectfully disagrees and reiterates the position herein. The position taken with respect to materials is that they are functional equivalents under conditions of electrophoresis.

Schucker teaches the electrophoretic deposition of electrolyte onto a substrate (para 0031-0034). Schucker embodies that yttria-stabilized zirconia as the preferred porous substrate (para 0031).

Tanabe et al. teach an electrophoretic deposition process. Most notably, it teaches that under electrophoresis conditions that stainless steel and zirconia (ZrO_2) are functional equivalents (example 1, notably the cathode materials of col. 4, line 23).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to recognize that stainless steel (as taught by Tanabe et al.) could be used instead of zirconia (wherein zirconia is embodied by both Schucker and Tanabe et al.), since stainless steel and zirconia are recognized equivalent materials in the art and the replacement of zirconia with stainless steel would have yielded the predictable result of being able to function as a substrate for electrophoretic deposition. It has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin,* 125 USPQ 416.

Furthermore, Examiner recognized that replacing the porous zirconia as taught by Schucker with the stainless steel of Tanabe et al. would not necessarily yield a porous stainless steel. Steck et al. is relied upon to obviate that the substrate should be porous for the intended use of a substrate mechanical strength and for impregnation purposes (wherein electrophoretic is an impregnation process, as particles are deposited on the substrate, thus impregnating it) (col. 2, lines 20-47).

Therefore, as set forth above, choosing between porous zirconia and porous stainless steel is merely a preference for the impregnation procedure of electrophoresis, is merely a materialistic choice (as set forth above), since both have been recognized equivalents under electrophoretic conditions, they would both reasonably be expected to act in the same manner.

Therefore, it is upheld that the previous office action has not confused substrate and cathode materials, as has been set forth above. Accordingly, Appellant's argument

that Tanabe et al.'s teaching of stainless steel being the cathode is not applicable, as it is not addressed in the manner that the rejection was made.

Thus the claimed invention is not held to be patentably distinct from the teachings of the prior art references relied upon in the rejections, and the rejections stand.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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